APPLICATION UNDER UNITED STATES PATENT LAWS

Atty. Dkt. No. PW 284082

(M#)

Invention: DATA REPRODUCTION APPARATUS AND DATA REPRODUCTION METHOD

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This is a:

☐ Provisional Application

☒ Regular Utility Application

☐ Continuing Application
   ☐ The contents of the parent are incorporated
   by reference

☐ PCT National Phase Application

☐ Design Application

☐ Reissue Application

☐ Plant Application

☐ Substitute Specification
Sub. Spec Filed _____
   in App. No. _____ / _____

☐ Marked up Specification re
Sub. Spec. filed _____
   In App. No _____ / _____

SPECIFICATION

TITLE OF THE INVENTION

DATA REPRODUCTION APPARATUS AND DATA REPRODUCTION
METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the
benefit of priority from the prior Japanese Patent
Application No. 2001-224859, filed July 25, 2001, the
entire contents of which are incorporated herein by
reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a digital broadcast
receiving system for receiving digital television
broadcasts typically by way of a satellite. More
particularly, the present invention relates to a data
reproduction apparatus and a data reproduction method
for reproducing a caption to be superimposed that is
transmitted by a character broadcasting system.

2. Description of the Related Art

As is well known, digital television broadcasting
has started recently and it is now possible for viewers
not only to view and listen to televised broadcasts but
also acquire various transmitted data by means of a
digital television receiving set adapted to receive
such data.

With a digital television broadcasting system, the
caption transmitted by character broadcasting that is

to be superimposed on a television program is displayed
at a predetermined position on the screen of the
television receiving set showing the television program.
As far as this patent document is concerned, the

5   expression of "character broadcasting" refers to both
data broadcasting and broadcasting of characters/
captions to be superimposed.

Currently, a caption to be superimposed in a
plurality of languages is transmitted by data

10   broadcasting and the viewer can select one of the
languages and display the caption of that language as
superimposed on the corresponding television program.

Meanwhile, it is expected that television
broadcasting stations will offer a large variety of

15   television programs than ever in the coming years.
Then, a caption may need to be superimposed in a
plurality of languages simultaneously.

However, when a caption is superimposed in more
than one languages simultaneously, it may be displayed

20   in an overlapping manner. Then, it will be difficult
for the viewers watching the program and reading the
caption to correctly recognize and understand it.

Known techniques relating to captions to be
superimposed include those disclosed in Jpn. Pat. Appln.

25   KOKAI Publication No. 9-65295 and Jpn. Pat. Appln.
KOKAI Publication No. 10-234016. However, these
documents do not describe anything about dissolving the

above identified problem that arises when displaying a caption in a plurality of languages simultaneously.

BRIEF SUMMARY OF THE INVENTION

In view of the above described circumstances, it is therefore the object of the present invention to provide a data reproduction apparatus and a data reproduction method that make it possible to change the size and the position of the area for displaying character information so that a caption may be superimposed in a plurality of different languages simultaneously.

According to the present invention, in an aspect thereof, the above object is achieved by providing a data reproduction apparatus comprising:

an input section receiving a first piece of caption information including a first piece of control information for displaying a caption on the screen of a television receiving set and a second piece of caption information including a second piece of control information for displaying the caption in a language different from that of the first piece of caption information; and

a controller displaying the first and second pieces of caption information simultaneously without overlap by modifying the value of at least either of the first and second pieces of control information.

In another aspect of the invention, there is

provided a data reproduction method comprising:

a reproducing reprocuding a first piece of caption information including a first piece of control information for displaying a caption on the screen of a television receiving set and a second piece of caption information including a second piece of control information for displaying the caption in a language different from that of the first piece of caption information; and

a controlling displaying the first and second pieces of caption information simultaneously without overlap by modifying the value of at least either of the first and second pieces of control information.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a schematic block diagram of an embodiment of the invention, illustrating a digital television receiving set to which the embodiment is applied;

FIG. 2 is a schematic illustration of pieces of control information to be used for displaying a caption by means of the embodiment of FIG. 1;

FIG. 3 is a schematic illustration of the block on the screen of a television receiving set for displaying a caption without compression by means of the embodiment of FIG. 1;

FIG. 4 is a schematic illustration of the normal mode of operation for displaying a caption without

compression by means of the embodiment of FIG. 1;

FIG. 5 is a flow chart of the operation of displaying a caption in the normal mode without compression by means of the embodiment of FIG. 1;

5   FIG. 6 is a schematic illustration of the compression mode of operation for displaying a caption by means of the embodiment of FIG. 1 when the size and the position of the area for displaying the caption are changed;

10   FIG. 7 is a flow chart of the operation of displaying a caption when the size and the position of the area for displaying the caption are changed;

FIG. 8 is schematic illustration of the screen of a television receiving set when the size and the

15   position of the area for displaying a caption are automatically defined;

FIG. 9 is schematic illustration of the screen of a television receiving set when the size and the position of the area for displaying a caption are

20   manually automatically defined;

FIG. 10 is a schematic illustration of a mode of operation for displaying a caption both in Japanese and in English simultaneously by means of the embodiment of FIG. 1;

25   FIG. 11 is a schematic illustration of another mode of operation for displaying a caption both in Japanese and in English simultaneously by means of the

embodiment of FIG. 1;

FIG. 12 is a schematic block diagram of another embodiment of the invention, illustrating a digital television receiving set to which the embodiment is applied; and

FIG. 13 is a flow chart of the operation of displaying a caption in a plurality of languages simultaneously by means of the embodiment of FIG. 12.

DETAILED DESCRIPTION OF THE INVENTION

Now, the present invention will be described in greater detail by referring to the accompanying drawing that illustrates preferred embodiments of the invention. FIG. 1 is a schematic block diagram of an embodiment of the invention, illustrating a digital television receiving set to which the embodiment is applied. More specifically, RF (radio frequency) signals are supplied to the tuner 11 of the digital television receiving set and one of the supplied signals is selected (tuned in) for display.

The selected RF signal is output from the tuner 11 and fed to separator 12, which separates the television broadcast program component and the caption character information component of the RF signal. Of these, the television broadcast program component is then fed to AV (audio video) decoder 13, which divides the received television broadcast program component further into the video component and the audio component and decodes

them. The video component is fed to display
controller 14.

On the other hand, the caption character
information component fed from the separator 12 is

5   supplied to caption decoders 15, 16 for decoding. The
decoded caption character information component is also
fed to the display controller 14. The two caption
decoders 15, 16 are adapted to concurrently decoded the
caption character information component in respective

10   languages.

Then, upon receiving operation-related information
from an operation unit 17 that may be a remote control
unit, the display controller 14 processes the data fed
from the AV decoder 13 and the caption decoders 15, 16

15   in such a way that the images they represent may be
displayed on the screen of monitor 18. If necessary,
the display controller 14 compresses and/or
synthetically combines the data before the images are
displayed on the screen of the monitor 18.

20   In the case of data broadcasting for transmitting
captions to be displayed, the values of six major items
as shown in the uncompressed column in FIG. 2 are made
to accompany the information on the language to be
displayed of the caption and transmitted as control

25   information for the digital television receiving set.

The display controller 14 of the digital
television receiving set obtains the character codes

indicating the types of the characters to be displayed

from the character code data decoded by the caption

decoders 15, 16 along with the above described various

pieces of control information and causes the monitor 18

5   to display the caption, using characters of the

specified types, on the basis of the outcome of its

operation of analyzing the control information.

Now, the control information will be described in

greater detail by referring to the "item" column and

10   the "uncompressed" column in FIG. 2. Firstly, the

"display area" shown in Item 1 specifies the area for

displaying a string of characters on the screen of the

monitor 18 in terms of horizontal length Xa and

vertical length Ya.

15   The "display start position" shown in Item 2

specifies the start position, or the upper left corner,

of the display area on the screen of the monitor 18 in

terms of horizontal position Xb and vertical position

Yb. Then, the "specification of character forming dot"

20   shown in Item 3 specifies the size of the characters to

be displayed in terms of horizontal length Xc and

vertical length Yc.

Then, the "specification of character spacing"

shown in Item 4 specifies the space Xd separating

25   adjacent characters and the "specification of line

spacing" shown in Item 5 specifies the space Yd

separating adjacent lines. Finally, the "display

block" shown in Item 6 specifies the display area of
each character including the space separating adjacent
characters and the space separating adjacent lines as
specified in Items 4 and 5 respectively in terms of
horizontal length Xe and vertical length Ye as shown in
FIG. 3.

When the normal mode of operation for displaying a
caption is required, the display controller 14 operates
to display the caption in a manner as shown in FIG. 4
on the screen of the monitor 18 according to the
specifications shown in the uncompressed column for the
above six items.

FIG. 5 is a flow chart of the operation of
displaying a caption in the normal mode without
compression by means of the embodiment of FIG. 1. Note
that FIG. 5 illustrates only the operation of
displaying the caption output from the caption decoder
15 and that of displaying the caption output from the
caption decoder 16 is omitted because it is similar to
the former operation.

As the operation is started (Step S1), the display
controller 14 specifies in Step S2 Xa and Ya for the
caption display area on the basis of the transmitted
data it has already acquired. Then, the display
controller 14 specifies in Step S3 Xb and Yb for the
display start position on the basis of the transmitted
data it has already acquired.

Thereafter, in Step S4, the display controller 14 receives the character code data obtained from the caption decoder 15. If the received character code data contains data for the caption display area and the display start position, the display controller 14 re-specifies the display area Xa, Ya and the display start position Xb, Yb it specified in Steps S2 and S3 respectively.

Then, in Step S5, the display controller 14 determines if the character code data obtained from the caption decoder 15 contains one or more than one character codes or not. If the character code data contains no character code (NO), it proceeds to Step S9, where it determines if there is a character code data not input from the caption decoder 15 yet or not. It returns to Step S4 if there is a character code data not input yet (YES), whereas it terminates the operation (Step S10) if there is no code data not input from the caption decoder 15 yet.

It, on the other hand, it is determined in Step S5 that the character code data contains one or more than one character codes (YES), the display controller 14 proceeds to Step S6, where it executes a processing operation of selecting various parameters for drawing characters. More specifically, it specifies punctuation codes for the specified character codes and also horizontal and vertical sizes (Xc, Yc) of

characters.

Additionally, in Step S6, the display controller 14 specifies character spacing (Xd) for characters and also line spacing (Yd) for lines of characters. Still additionally, it specifies the color of the characters to be displayed, the color of the background of the characters, the color between the foreground and the intermediary and the color between the background and the intermediary. Then, it specifies various attributes of the display including the use or nonuse of boundary lines for the characters to be drawn, the use or non use of underlines, the use or nonuse of parentheses, the use or nonuse of polarity inversions and the use or nonuse of flashing effect. If boundary lines are used, the color to be used for drawing the lines is also specified.

Furthermore, the display controller 14 specifies the position for drawing characters in the coordinate system. More specifically, it determines if the block of the character to be drawn firstly is out of the display area or not. If the former is found within the latter, the values specified for the operation originating point is held unchanged. If, on the other hand, the former is found outside the latter, display controller 14 re-specifies values (Xf, Yf) for the operation originating point after proceeding to the next line.

Then, in Step S7, the display controller 14
executes the operation of drawing characters on the
basis of the parameters specified in Step S6 and
proceeds to Step S8, where it shifts the position for

5   drawing characters in the coordinate system (Xf, Yf)
before proceeding to Step S9. If the position (Xf, Yf)
is found outside the display area, then, the display
controller 14 specifies values (Xf, Yf) for the
operation originating point after moving to the next

10   line before proceeding to Step S9.

Now, the operation of controlling the size and the
position of the area for displaying a caption so as to
make them variable will be described below. This
control operation is realized by the display controller

15   14 as it carries out certain predetermined arithmetic
operations on the specified values of the items of the
control information it has acquired from the caption
decoders 15, 16 according to a request from the
operation unit 17.

20   For example, the "1/2 compression" column in
FIG. 2 shows the values of the items obtained by
halving the specified respective values. More
specifically, the "display area" shown in Item 1
specifies the area for displaying a string of

25   characters in terms of horizontal length Xa/2 and
vertical length Ya/2.

The "display start position" shown in Item 2

specifies the start position of the display area in terms of horizontal position Xb/2 and vertical position Yb/2.

Then, the "specification of character forming dot" shown in Item 3 specifies the size of the characters to be displayed in terms of horizontal length Xc/2 and vertical length Yc/2. Then, the "specification of character spacing" shown in Item 4 specifies the space Xd/2 separating adjacent characters and the "specification of line spacing" shown in Item 5 specifies the space Yd/2 separating adjacent lines. Finally, the "display block" shown in Item 6 specifies the display area of each character respectively in terms of horizontal length (Xc/2) + (Xd/2) for Xe and vertical length (Yc/2) + (Yd/2) for Ye.

In this way, it is now possible to reduce the area for display the caption on the screen of the monitor 18 to 1/2 both in the horizontal direction and in the vertical direction and shift the display position.

FIG. 6 shows an area for displaying the caption defined by reducing its original size to 1/2 both in the horizontal direction and in the vertical direction and the start position of the display area from the original (Xb, Yb) to (Xb', Yb').

FIG. 7 shows a flow chart of the operation of the display controller 14 for reducing the size of the area for displaying the caption to 1/2 both in the

horizontal direction and in the vertical direction and shifting the display position.

Note that FIG. 7 illustrates only the operation of displaying the caption output from the caption decoder 15 and that of displaying the caption output from the caption decoder 16 is omitted because it is similar to the former operation.

As the operation is started (Step S11), the display controller 14 modifies in Step S12 (X_a, Y_a) for the caption display area specified on the basis of the transmitted data it has already acquired to $(X_a' = X_a/2, Y_a' = Y_a/2)$. Then, the display controller 14 modifies in Step S13 (X_b, Y_b) for the display start position specified on the basis of the transmitted data it has already acquired to (X_b', Y_b').

Thereafter, in Step S14, the display controller 14 receives the character code data obtained from the caption decoder 15. If the received character code data contains data for the caption display area and the display start position, the display controller 14 re-modifies the display area and the display start position it modified in Steps S12 and S13 to (X_a', Y_a') and (X_b', Y_b') respectively.

Then, in Step S15, the display controller 14 determines if the character code data obtained from the caption decoder 15 contains one or more than one character codes or not. If the character code data

contains no character code (NO), it proceeds to Step

S19, where it determines if there is a character code

data not input from the caption decoder 15 yet or not.

It returns to Step S14 if there is a character code

5   data not input yet (YES), whereas it terminates the

operation (Step S20) if there is no code data not input

from the caption decoder 15 yet.

It, on the other hand, it is determined in Step

S15 that the character code data contains one or more

10   than one character codes (YES), the display controller

14 proceeds to Step S16, where it executes a processing

operation of selecting various parameters for drawing

characters. More specifically, it specifies

punctuation codes for the specified character codes and

15   modifies the horizontal and vertical sizes (Xc, Yc) of

characters to $(Xc' = Xc/2, Yc' = Yc/2)$.

Additionally, in Step S16, the display controller

14 modifies the character spacing (Xd) to $(Xd' = Xd/2)$

for characters and also the line spacing (Yd) for lines

20   of characters to $(Yd' = Yd/2)$. Still additionally, it

specifies the color of the characters to be displayed,

the color of the background of the characters, the

color between the foreground and the intermediary and

the color between the background and the intermediary.

25   Then, it specifies various attributes of the display

including the use or nonuse of boundary lines for the

characters to be drawn, the use or non use of

underlines, the use or nonuse of parentheses, the use
or nonuse of polarity inversions and the use or nonuse
of flashing effect. If boundary lines are used, the
color to be used for drawing the lines is also
5   specified.

Furthermore, the display controller 14 specifies
the position for drawing characters in the coordinate
system. More specifically, it determines if the block
of the character to be drawn firstly is out of the
10   display area relative to the values (Xf, Yf) defined
for the operation originating point or not. If the
former is found within the latter, the values specified
for the operation originating point is held unchanged.
If, on the other hand, the former is found outside the
15   latter, display controller 14 re-specifies the modified
values (Xf', Yf') for the operation originating point
after proceeding to the next line.

Then, in Step S17, the display controller 14
executes the operation of drawing characters on the
20   basis of the parameters specified in Step S16 and
proceeds to Step S18, where it shifts the position for
drawing characters in the coordinate system (Xf, Yf)
before proceeding to Step S19. If the position (Xf,
Yf) is found outside the display area, then, the
25   display controller 14 modifies the values (Xf, Yf)
specified for the operation originating point after
moving to the next line to (Xf' Yf') before proceeding

to Step S19.

With the above operation, it is now possible to modify the size and the position of the area for displaying the caption. Then, it may be so arranged that, if the television program turned in by the viewer is compressed and displayed, the embodiment automatically computes the start position (Xb', Yb') for drawing characters for the caption by referring to the lower left corner of the screen. Then, the caption is displayed at an optimal position on the screen as shown in FIG. 8.

Alternatively, it may be so arranged that the start position (Xb', Yb') is manually defined by means of the operation unit 17 so that the caption display area may be moved to any place on the screen. When, the caption display area is manually defined, it is shown by dotted lines as shown in FIG. 9 to indicate that the operation of manually defining the caption display area is going on.

If the caption display area is moved automatically or manually and made to partly go out of the screen, the display controller 14 forces the caption display area to stay on the screen.

FIG. 10 shows a caption displayed both in Japanese JP and in English ENG simultaneously on the screen of the monitor 18. In this case, the caption character information component for Japanese is decoded by the

caption decoder 15 and supplied to the display controller 14, while the caption character information component for English is decoded by the caption decoder 16 and supplied to the display controller 14.

5   Then, the caption in Japanese JP is not compressed and displayed at the proper position on the screen by the display controller 14 on the basis of the control information for displaying the caption transmitted by data broadcasting, whereas the caption in English ENG

10   is compressed horizontally and vertically to 1/2 and moved to an upper left position on the screen. Then, the caption in Japanese JP and the caption in English ENG are displayed simultaneously without overlapping each other.

15   The frame enclosing the display area for the caption in Japanese JP and the frame enclosing the caption in English ENG may be shown in different colors and/or the characters of the caption in Japanese JP and those of the caption in English ENG may be shown in

20   different colors.

FIG. 11 is a schematic illustration of another mode of operation for displaying a caption both in Japanese JP and in English ENG simultaneously on the screen of the monitor 18 by means of the embodiment of

25   FIG. 1. In this case, the television program tuned in by the viewer is compressed and displayed and the caption in Japanese JP is also compressed and displayed

within the image of the television program, whereas the
caption in English ENG is also compressed and displayed
outside the image of the television program.

FIG. 12 is a schematic block diagram of another

5   embodiment of the invention, illustrating a digital
television receiving set to which the embodiment is
applied.   In FIG. 12, the components similar to or same
as those of FIG. 1 are denoted respectively by the same
reference symbols.   A translation processor 19 is

10   connected to the display controller 14.   The
translation processor 19 has a functional feature of
converting the character codes of a caption in Japanese
into those in English.

FIG. 13 is a flow chart of the operation of the

15   display controller 14 for displaying a caption in a
plurality of languages simultaneously by means of the
embodiment of FIG. 12 comprising the translation
processor 19.   Referring to FIG. 13, as the operation
is started (Step S21), the display controller 14

20   determines in Step S22 if the tuned in program is
accompanied by a caption or not.   If the program is not
accompanied by a caption (NO), the operation is
terminated (Step S29).

If it is determined that the turned in program is

25   accompanied by a caption (YES), the display controller
14 proceeds to Step S23, where the number of language
used for the caption is equal to one or not.   If the

number is not equal to one (NO), the display controller 14 proceeds to Step S24, where it carries out a processing operation for displaying the caption in the selected more than one languages before terminating the operation (Step S29).

If, on the other hand, the number if equal to one (YES), the display controller 14 proceeds to Step S25, where it determines if the language of the caption is Japanese or not. If the language is not Japanese (NO), the display controller 14 moves to Step S24. If, on the other hand, the language is Japanese (YES), the display controller 14 proceeds to Step S26, where it carries out a processing operation for displaying the caption in Japanese.

Thereafter, the display controller 14 controls the translation processor 19 to cause it to convert the character codes of a caption in Japanese into those in English in Step S27 and proceeds to Step S28, where it displays the character codes in English as caption in English simultaneously with the caption in Japanese at a position that does not overlap the position of the latter before terminating the operation (Step S29).

With this arrangement, if the caption is broadcast only in Japanese by character broadcasting, the caption in Japanese can be translated into English and the caption in English can be displayed simultaneously with the caption in Japanese.

While the embodiment of FIGS. 12 and 13 is described in terms of translating the caption in Japanese into English and displaying the caption in English, it may be appreciated that the caption may be

5   translated into one or more than one desired languages when corresponding translation means are provided.

While the present invention is described above by way of two preferred embodiments adapted to display a caption transmitted by way of digital television

10   broadcasting, the present invention is by no means limited thereto and can be used to display a caption in a plurality of languages simultaneously on a program stored in a DVD (digital versatile disc) with the caption.